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CURRENT PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES[a]

February 26–March 25, 1933

The prevalence of certain important communicable diseases, as indicated by weekly telegraphic reports from State health departments to the United States Public Health Service, is summarized in this report. The underlying statistical data are published weekly in the PUBLIC HEALTH REPORTS, under the section entitled "Prevalence of Disease."

Meningococcus meningitis.—The number of cases of meningitis (393) reported for the current 4-week period was 1.3 times that reported for the corresponding period last year. The number was, however, approximately 300 and 800 less than was reported for the same period in 1931 and 1930, respectively. Each geographic area except the Middle and South Atlantic areas reported appreciable increases. The greatest increases were shown in States in the North and South Central regions and the Mountain region. Illinois reported 92 cases for the current period as compared with 21 last year, Missouri 31 as against 3 last year, and Colorado 17 as compared with 2 last year. With the exception of Kentucky, all States in the South Central areas reported increases. The number of cases (60) reported from those areas was twice the number reported for this period last year.

Smallpox.—Smallpox maintained the relatively low level of the preceding 4-week period. For the entire reporting area there were 810 cases, as compared with 1,413, 3,750, and 6,502 for the corresponding period in the years 1932, 1931, and 1930, respectively. The South Atlantic and Mountain and Pacific areas reported slight increases over last year, but the incidence was still considerably below that of the preceding years. In other areas the current incidence was the lowest in the five years for which data are available.

Poliomyelitis.—The reported incidence of poliomyelitis (50 cases) was practically the same as that for the preceding 4-week period, and was the lowest for this period in the five (preceding) years for

[a] From the Office of Statistical Investigations, U. S. Public Health Service. The numbers of States included for the various diseases are as follows: Typhoid fever, 48; poliomyelitis, 48; meningococcus meningitis, 48; smallpox, 48; measles, 48; diphtheria, 48; scarlet fever, 48; influenza, 38 States and New York City. The District of Columbia is counted as a State in these reports.

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which data are available. While in some geographic areas the incidence for the current period was slightly higher than that for the corresponding period last year, the numbers of cases were not large, and in general the situation was very favorable in all areas.

Diphtheria.—In comparison with recent years the incidence of diphtheria continued very low. For the current period the number of cases (2,886) was only about 75 per cent of that reported for the corresponding period in the years 1932 and 1931. For this period in 1930 the number of cases was 5,350. Each geographic area shares in the favorable situation at the present time.

Typhoid fever.—The number of cases of typhoid fever reported for the current 4-week period was 545, as compared with 693, 475, and 734 for the corresponding period in the years 1932, 1931, and 1930, respectively. Each geographic area, except the Mountain, either approximated last year's incidence for the same period or showed an appreciable decrease. Due to an increase in Montana from 5 cases for this period last year to 26 for the current period, the number of cases (45) for the whole Mountain area represented an increase of almost 100 per cent over last year's figure.

Scarlet fever.—The current period showed a slight increase in scarlet fever over the corresponding period in each of the four preceding years. For the four weeks ended March 25 the number of cases totaled 26,549. The disease seemed to be most prevalent in the East North Central and Mountain and Pacific areas. While the relative increase was not large, the 9,000 cases reported from the East North Central States was the highest for this period in five years, and the 1,500 reported from the Mountain and Pacific areas was the highest since 1930.

Measles.—All sections of the country showed a continued seasonal increase of measles during the current 4-week period. The number of cases reported (62,153) was 1.3 times that for the corresponding period last year. For this period in 1931 and 1930 there were 69,621 and 53,110 cases, respectively. The disease was most prevalent in the West North Central and South Central groups of States. The number of cases (7,870) reported from the West North Central groups was more than five times the number for last year; the South Central groups reported 4,716 cases for the current period, as against 1,652 last year. Other areas closely approximated last year's incidence. The Mountain and Pacific reported 25 and 10 per cent decreases, respectively.

Influenza.—For the first time since early in 1932 the influenza incidence fell below that of a corresponding 4-week period of the preceding year. For the current period 10,329 cases were reported, as against 36,368, 25,635, and 8,474 for the corresponding period in the years 1932, 1931, and 1930, respectively. At this time in 1932 there

was a considerable excess of cases, and slightly earlier in 1931 there was a minor epidemic. The 1930 figure, however, is free from any epidemic tendency and the incidence for the current period approached the 1930 level in all areas.

Mortality, all causes.—The average mortality rate from all causes in large cities, as reported by the Bureau of the Census for the four weeks ended March 25 was 11.8 per thousand population (annual basis). For this period in the years 1932, 1931, and 1930 the rate was 13.5, 13.7, and 13.5, respectively. The current rate is the lowest in the eight years for which data are available.

EXPERIMENTAL STUDIES OF WATER PURIFICATION

VI. General Summary and Conclusions

By H. W. Streeter, *Sanitary Engineer, United States Public Health Service*

INTRODUCTORY

Previous reports of this series [1] have dealt with the methods and results of certain experiments which were undertaken by the Public Health Service in 1924, at a fully equipped experimental water-filtration plant located at Cincinnati, Ohio. The primary object was to verify, under conditions subject to adjustment and control, observations made in 1915–16 and in 1923–24 on the efficiency and limitations of a selected group of 17 representative municipal water-purification plants treating raw waters of the general type found in the Ohio and other rivers of the Middle Western and Eastern States.[2] During the progress of the experimental studies, a further observational survey was made of the performance of a second group, consisting of 14 municipal filtration plants treating raw waters taken from the Great Lakes and their interconnecting waters.[3]

From these combined experimental and observational studies, involving the operation of the experimental plant for a period of five years and the collection and analysis of performance records from 31 municipal water-purification systems, a considerable volume of comparative data was obtained bearing on the efficiency and limitations of water-purification processes currently used in the areas embraced by the studies. In this final paper of the present series, it is purposed to summarize very briefly the results of these combined experimental and observational studies and to state whatever general conclusions may appear justified from them.

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[1] See Public Health Reports, Oct. 1, 1926, pp. 2121–2146 (Reprint No. 1114); July 15, 1927, pp. 1841–1859 (Reprint No. 1170); July 4 and 11, 1930, pp. 1521–1536 and 1597–1623 (Reprint No. 1392); Dec. 19, 1930, pp. 3105–3128 (Reprint No. 1434).

[2] For a detailed report of these observations, see Public Health Bulletin No. 172.

[3] For a full report of this survey, see Public Health Bulletin No. 193.

For convenience of reference, the three series of observations embraced by these studies, together with the data obtained from them, may be designated as follows:

Series A: Experimental studies at Cincinnati.

Series B: Observational surveys of filtration plants located along the Ohio River.

Series C: Observational surveys of filtration plants located along the Great Lakes.

In the present report, Series B has been limited to the observations made in 1923–24 at 10 filtration plants located on the Ohio River. The results obtained at the other 7 plants included in the 1923–24 survey having been similar to those observed at the 10 Ohio River plants, their inclusion would not serve any added purpose in the case at hand.

RELATIVE CONDITIONS OF OBSERVATIONS

The conditions under which both the experimental and field observations of these studies were made have been so fully described in previous reports [4] that attention will be confined here to pointing out a few important similarities and divergences in them affecting the interpretation of the data.

As the experimental plant drew its main raw-water supply from the Ohio River, the conditions in this respect under which the observations of Series A and B were made were very similar. They diverged, however, in both of these series from conditions in Series C, in that raw-water supplies taken from the Great Lakes differ from those of the Ohio River, both in their general character, notably in respect to turbidity and alkalinity, and in the manner and extent of their variability. Along the Great Lakes, variations in the quality of water at the intakes thus are often wide and sudden and are unaccompanied by corresponding changes in turbidity, whereas in the Ohio River they are usually less sudden and are marked by readily perceptible changes in turbidity.

Although a large majority of the 31 municipal filtration plants surveyed were of the same general type as the experimental plant, embodying the usual features of the rapid-sand filtration process, numerous variations in certain factors of their design and operation were observable. To afford a basis for comparison of some of the more important factors, the following relative figures have been transcribed from the descriptive data contained in previous reports of these studies: [5]

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[4] See Public Health Bulletin No. 172, pp. 41–43, 69–73, and 175–177; Public Health Bulletin No. 193, pp. 6–9; Reprint No. 1114 (pp. 9–12) from Public Health Reports.

[5] See Reprint No. 1114 (pp. 1–9) from Public Health Reports; Public Health Bulletin No. 172, Appendix C, pp. 400–403; Public Health Bulletin No. 193, Appendix A, pp. 90–92.

	Range	Mean
1. Average total sedimentation period (hours) (based on rated capacity):		
Experimental plant (Series A)	3–12	6
Ohio River plants (Series B)—		
a. With double-stage sedimentation	10–66	[a]32
b. With single-stage sedimentation	2–16	6
Great Lakes plants (Series C)	2– 8	3. 4
2. Average coagulant dosage:		
Experimental plant (Series A)	0. 5–4. 9	2. 6
Ohio River plants (Series B)	0. 3–4. 9	1. 2
Great Lakes plants (Series C)	0. 6–5. 6	[b]1. 6
3. Filtration:		
a. Average rate (million gallons per acre daily)—		
Experimental plant (Series A)		125
Municipal plants (Series B and C)	60–150	95
b. Effective size of sand (minimum)—		
Experimental plant (Series A)		0. 40
Municipal plants (Series B and C)	0. 30–0. 76	0. 44
c. Depth of sand (inches)—		
Experimental plant (Series A)		27
Municipal plants (Series B and C)	24–36	30

In connection with these relative figures it is particularly noteworthy that the total periods of sedimentation provided at the five Ohio River plants equipped with double-stage sedimentation were very considerably in excess of those afforded both by the experimental plant and by the five Ohio River plants having only single-stage sedimentation, which were approximately the same. The corresponding periods for which the Great Lakes plants were designed were decidedly less than at either the experimental or the Ohio River plants. It also will be noted that the rates of filtration observed at both groups of municipal plants combined averaged about 25 per cent lower than the standard rate, 125 million gallons a day, used at the experimental plant. In all other respects, except for the somewhat higher coagulant dosage at the experimental plant, the average physical conditions of operation shown by the comparative figures were fairly similar for all three series of observations.

COMPARABILITY OF LABORATORY DATA

The laboratory data obtained from each of the three series of observations were based largely on the current "Standard Methods" of the American Public Health Association. In connection with the observations of Series A and B, carefully standardized methods, prescribed in detail, were followed. In those of Series C, it was necessary to use laboratory data forming a part of the past record of each plant; hence the laboratory methods followed were not subject

[a] Average period of primary sedimentation=27 hours, or 85 per cent of total.

[b] Corrected for error in average for 1 plant (Ashtabula), as given in Public Health Bulletin No. 193, Table No. 8, p. 37. The correct average for this plant should be 0.9 g. p. g.

to standardized control. In so far as the *B. coli* data were concerned, those reported from 9 of the 14 Great Lakes plants surveyed were found to be satisfactory for comparative purposes. The *B. coli* data obtained from the 10 Ohio River plants (Series B) were subject to a single deficiency in that the routine tests made on the filtered and final (chlorinated) effluents were confined, in each case, to five 10-cubic centimeters portions of each sample. In Series A and C, however, results from tests of these effluents were available in added single portions of 1.0 cubic centimeters and 0.1 cubic centimeters, respectively, thus permitting the detection of this group of organisms in densities higher than was possible in the more limited tests of Series B.[6]

In spite of the effort made to secure well-standardized bacteriological data, minor divergences in laboratory methods, due in some cases to variances in established technique, doubtless affected the comparability of the results reported from the different plants. As regards the ordinary physical and chemical determinations, the diversity in methods and results among the several plants probably was relatively small, as these methods are well established and the results obtained from them are influenced to a less extent by minor variations in technique than is the case with the bacteriological tests.

OBSERVATIONS ON BACTERIAL EFFICIENCY

In previous reports of these studies, detailed tables and illustrative charts have been presented showing the average efficiencies of bacterial removal, average quality of effluents, and relations between bacterial quality of influent and effluent waters noted in each one of the three series of observations embraced by the studies. These data will be brought together here mainly in the form of comparative charts, omitting the detailed tabulations of such data already presented, for which reference is made to the reports above indicated.

AVERAGE EFFICIENCIES OF PURIFICATION

The average efficiencies of purification observed in these studies have been expressed generally in terms of the percentages of raw, or influent, water bacteria remaining in the effluent of a given stage of treatment, rather than in terms of the percentages of bacteria removed. This method has permitted a more ready comparison of significant differences in the smaller figures than would be the case if the corresponding percentages of bacteria removed were given. In these reports the term "influent" water, as distinguished from "raw" water, has been used to designate water delivered to any given stage of treatment.

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[6] See Public Health Bulletin No. 172, pp. 22-84; also Reprint No. 1170 (pp. 11-14) from Public Health Reports.

In Figures 1 and 2 are shown graphically the residual percentages of 37° C. plate-growing bacteria and of *B. coli* at each stage of treatment, derived from averages for each series of observations. In Figure 1 the percentages have been referred to the bacterial content of the raw water, and in Figure 2 to that of the influent water of each stage of treatment, the latter thus representing the relative efficiencies of each separate stage. In order that the percentage figures derived from the three series of observations might be more nearly comparable among themselves, they were derived from averages taken over periods in which the mean density of bacteria in the several raw waters was approximately the same,[7] though the period in each instance approximated one year.

On comparing the corresponding percentages given in the table for the three series, certain interesting similarities and contrasts are noted. First is the general parallelism shown between the average efficiency of the experimental plant and that of the Ohio River plants (Series A and B),[8] which was an important factor in determining the applicability of the experimental results to parallel conditions of full-scale plant performance. Second is the well-marked superiority exhibited both by the experimental plant and the average Ohio River plant, as compared with the average Great Lakes plant, in respect to the bacterial efficiency of the prefiltration and filtration stages of treatment. Less divergence in this respect was shown between the over-all efficiencies of bacterial removal, including postchlorination, indicating that the Great Lakes plants, by throwing a relatively greater burden of purification on the postchlorination treatment, were able to offset in part their lower sedimentation and filtration efficiency.

That the proportion of the total burden of purification borne by postchlorination was higher at the Great Lakes plants than observed in the treatment of Ohio River water is shown more clearly by the comparative percentages of the total raw-water bacteria removed by each stage of treatment, presented in Table 1, computed from differences in the residuals at each stage, as given in Figure 1.

TABLE 1.—*Raw-water bacteria removed by each stage of treatment*

Stage of treatment	Percentage of total raw-water bacteria removed—					
	24-hours, 37° C., plate count			B. coli index		
	Series A	Series B	Series C	Series A	Series B	Series C
Coagulation-sedimentation	72.9	82.6	59.0	60.1	77.5	62.7
Filtration	25.9	16.6	27.2	39.78	22.42	32.50
Postchlorination	1.14	.68	12.36	.10	.07	4.24
Combined	99.94	99.88	98.56	99.98	99.99	99.44

[7] See Reprint No. 1114 (pp. 21–22) from Public Health Reports.

[8] A single exception is noted in the higher efficiency of chlorination shown by the experimental plant in the removal of 37° C. plate-growing bacteria. This observation was inconsistent, however, with the corresponding indicated efficiency of *B. coli* removal, which agreed fairly well for the two series.

It thus is indicated that at the experimental plant and the average Ohio River plant, all except approximately 1 per cent, or less, of the raw-water bacteria were removed prior to final chlorination, whereas at the average Great Lakes plant the proportion of the total bacteria

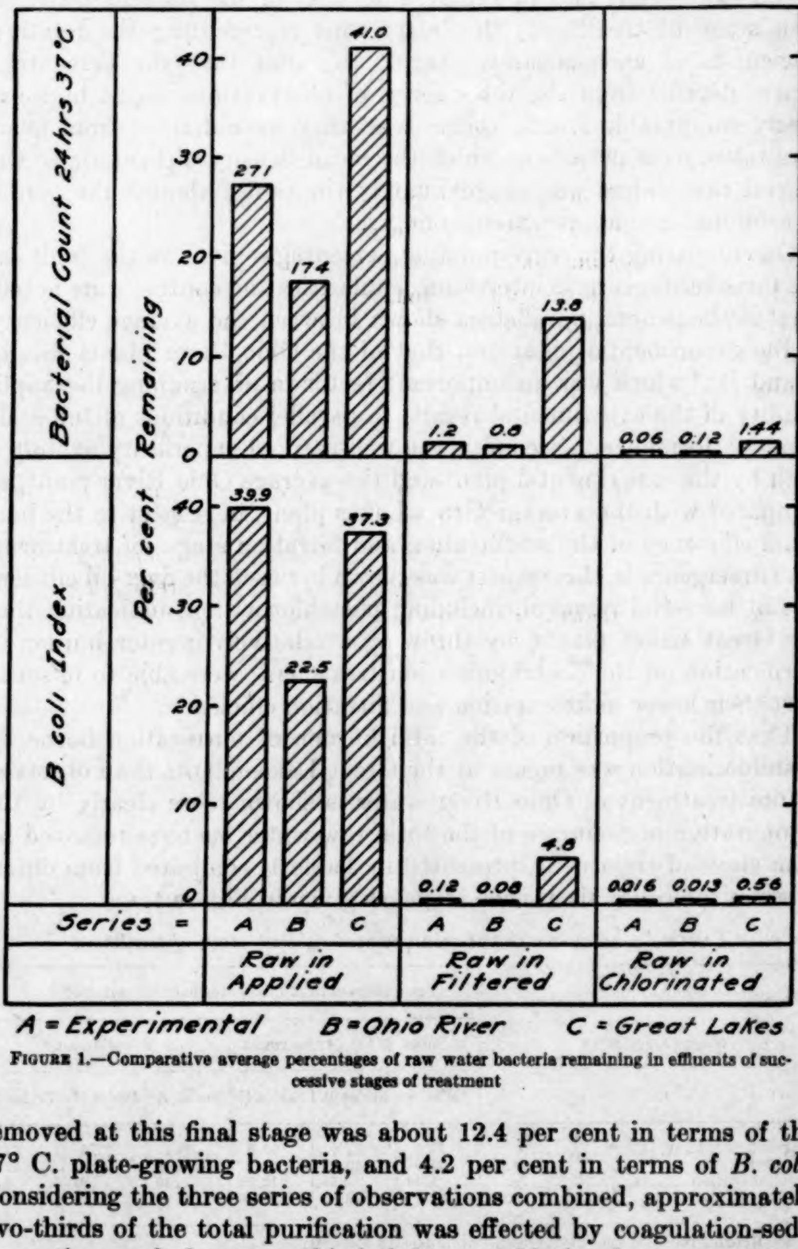

Figure 1.—Comparative average percentages of raw water bacteria remaining in effluents of successive stages of treatment

removed at this final stage was about 12.4 per cent in terms of the 37° C. plate-growing bacteria, and 4.2 per cent in terms of *B. coli.* Considering the three series of observations combined, approximately two-thirds of the total purification was effected by coagulation-sedimentation, and about one-thirtieth by postchlorination.

As to the possible reasons for the lower efficiency of the Great Lakes plants, with postchlorination excluded, these studies have afforded only indirect evidence, though a detailed comparative study of two Great Lakes plants and two Ohio River plants of the same type and design has indicated that it can not be attributed directly to the greater clarity of Great Lakes water.[9] It is possible that the marked divergence existing between the pH value of the Great Lakes water, which ranges from 7.8 to 8.2, and that of Ohio River water, ranging from 6.8 to 7.2, may account in part for the difference observed, as experiments made in connection with these studies have indicated [10] that the bacterial efficiency of coagulation-sedimentation may become sharply diminished at pH values exceeding 7.0 or thereabouts. It also may be possible that in the purification of Great Lakes waters the lower dosages of coagulant used, which are adequate for clarification but not sufficiently high for more effective bacterial reduction, and also the lower average periods of sedimentation provided, may account in part for the divergence observed in this respect. In the coagulation of Ohio River water, the greater amounts of coagulant required for clarification and the longer sedimentation periods used would tend to result in higher degrees of bacterial removal. These assumptions may be justified in view of the current tendency in the operation of municipal rapid-sand filtration plants to depend largely on chlorination for bacterial removal and assign to the preliminary sedimentation and filtration processes merely the function of clarification.

VARIATIONS IN BACTERIAL EFFICIENCY

An outstanding characteristic of the efficiency of bacterial removal observed in the experimental studies and at the several municipal filtration plants was its wide degree of variability, both among the different individual plants as compared with each other and at each plant from day to day and month to month. In so far as the variations noted among the individual plants were concerned, they were found to bear a fairly broad relation to divergences in the mean density of raw-water pollution [11] and to certain factors of plant design and operation, such as, for example, the total period of sedimentation and the average dosage of coagulants. [12]

Diurnal and other temporal variations in the over-all bacterial efficiency of each plant, and likewise in the efficiency of individual stages of treatment, were difficult to explain in many instances, though in general they were found to be related to fluctuations in the turbidity and bacterial content of the raw water and in certain conditions of

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[9] See Public Health Bulletin No. 193, Appendix B, pp. 93–100.

[10] See Reprint No. 1392 (pp. 20–26) from Public Health Reports.

[11] See Public Health Bulletin No. 193, Tables 5A and 5B, pp. 29 and 31.

[12] See Public Health Bulletin No. 193, pp. 28–38; also Reprint No. 1392 (pp. 1–16 and 27–41) from Public Health Reports.

treatment, notably the dosage of chemicals, which are subject to frequent changes and readjustments. Probably many conditions of plant operation, not ordinarily subject to precise record, may influence the efficiency of bacterial removal, such as minor variations in flow, in the elevation of water surface in basins, in the rate of filtration, in the density of floc formation and in the residual chlorine content of chlorinated effluents. From observations made in the course of the experimental studies, it was indicated that efficiencies of bacterial removal are extremely sensitive to minor changes in conditions such as those enumerated. Whatever their causes may be, these variations in bacterial efficiency appear to be a more or less normal phenomenon in the performance of water-purification processes, for which due allowance must be made in undertaking to evaluate such performance.

EFFECTS OF CERTAIN MODIFICATIONS IN PRELIMINARY TREATMENT

In the course of the experiments described in previous reports, several series of long-term observations were made on the effects of certain modifications in the preliminary treatment of water on the efficiency and limitations of the rapid-sand filtration process. For the purposes of these supplementary observations, minor changes were made in the construction and arrangement of the experimental filtration plant, as have been described in the preceding two reports [13] of this series. These changes involved mainly the division of the experimental plant into two parallel sections throughout and the installation of a mechanical agitator unit for use in connection with experiments on the efficiency of excess-line treatment. With the parallel-division arrangement, it was possible to compare the efficiencies observed with any two different treatments of the same raw water under identical conditions.

The experiments carried out under this heading were divided into the following four series:

1. The effects of variations in the period of sedimentation;
2. The effects of variations in certain conditions of coagulation;
3. The bacterial efficiency of raw-water prechlorination;
4. The bacterial efficiency of excess-lime treatment.

Of the four series of experiments above listed, all except the fourth, dealing with the bacterial efficiency of excess-lime treatment, have been fully described in previous reports of this series.[14] The fourth series has been discussed in connection with another paper.[15] In this report it is proposed to summarize very briefly the main conclusions derived

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[13] Public Health Reports, July 4, 1930 (Reprint No. 1392), and Dec. 19, 1930 (Reprint No. 1434).

[14] See Public Health Reports, vol. 45, Nos. 27 and 28, July 4 and 11, 1930, pp. 1521–1536 and 1597–1623 (Reprint No. 1392); vol. 45, No. 51, Dec. 19, 1930, pp. 3105–3128 (Reprint No. 1434).

[15] Proc. Eighth Kansas Annual Water Works School, 1930, p. 42.

VARIATIONS IN SEDIMENTATION PERIOD [16]

from these four series of observations, referring to the previous publications noted for details.

The results of experiments regarding the effects of variations in the period of sedimentation on the bacterial efficiency of prefiltration treatment indicated that substantial gains in the efficiency of coagulation-sedimentation resulted from prolongation of the nominal period of sedimentation up to 8 or 9 hours and measurable gains with periods up to 12 hours. It also was shown that a relationship between the bacterial quality of influent and effluent waters was connected with the period of sedimentation by the following equations:

$$E_a = \frac{0.572}{\log T} R^{0.86} \qquad (1)$$

$$E_c = \frac{0.000344}{\log T} \cdot R^{0.38} \qquad (2)$$

in which (R) donotes the *B. coli* index of the raw water (E_a), the corresponding *B. coli* index per 100 cubic centimeters of the applied (coagulated-settled) water, (E_c) the corresponding *B. coli* index (per 100 cubic centimeters) of the postchlorinated filtered effluent, and (T) the nominal period of sedimentation, in hours. These relationships are of interest mainly as indicating that the efficiency of sedimentation, when measured in bacterial terms, appears to be a logarithmic function of the total sedimentation period, all other conditions being equal. The importance of the time factor in settling-basin efficiency is thus emphasized.

VARIATIONS IN CONDITIONS OF COAGULATION [17]

The results of experiments made on the effects of variations in certain conditions of coagulation led to the following main conclusions:

(1) Variations in the pH of the coagulation reaction from 5.6 to 6.9 produced little effect on the efficiency of coagulation-sedimentation, with aluminum sulphate as the coagulant. The efficiency with this same coagulant became sharply diminished, however, with pH values exceeding 7.0 and slightly improved with pH values approaching 5.5.

(2) The bacterial efficiency of double-stage coagulation, with two separate stages of sedimentation, was consistently greater than that of single-stage coagulation with one stage of sedimentation, though with the same total amount of coagulant and the same total period of sedimentation, little if any difference was observable between the results shown by double-stage and single-stage coagulation when carried out in conjunction with two separate stages of sedimentation.

[16] See Public Health Reports, July 4, 1930, pp. 1521-1536 (Reprint No. 1392, pp. 1-16).
[17] See Public Health Reports, July 11, 1930, pp. 1597-1623 (Reprint No. 1392, pp. 16-42).

This observation was consistent with that of the relatively higher efficiency of double-stage sedimentation at five Ohio River plants, which was associated with much longer total periods of sedimentation than were provided at the plants of this group equipped with only single-stage sedimentation.

(3) A fairly consistent relation was shown between the amounts of coagulant added to the raw water and the resulting bacterial efficiency. This relation was found to hold irrespective of raw-water turbidity or bacterial content, though it was more apparent when the turbidity and bacterial numbers were higher.

From these conclusions, the general inference may be drawn that measurable gains in the efficiency of water-filtration processes of the rapid-sand type can be attained through prolongation of the total period of sedimentation, through the addition of greater amounts of coagulant, and, to some extent, through adjustments of the hydrogen-ion concentration of the coagulation reaction, though where lime and sulphate of iron are used this third condition would be relatively unimportant, owing to the broader zone of insolubility of iron, as compared with aluminum hydroxides. Perhaps the most interesting result of these particular experiments, however, was the observation that double-stage coagulation-sedimentation does not appear to have any well-marked advantage over single-stage treatment of the same kind, where the total periods of sedimentation are the same. Considered in the light of this observation, the higher efficiency of the five Ohio River plants equipped with double-stage sedimentation may be explained in view of the longer total periods of retention provided by the combined primary and secondary basins at these plants.

RAW WATER PRECHLORINATION [18]

From the series of experiments in raw-water prechlorination it was concluded that this auxiliary measure of treatment, when used in conjunction with rapid-sand filtration, results in a decided gain in over-all bacterial efficiency, though it was noted that the application to filters of water containing even small amounts of residual chlorine caused a definite reduction in the bacterial efficiency of filtration and of postchlorination, respectively. Chlorination of water prior to filtration also appeared to effect a partial sterilization of the upper portion of the filtering medium, though the experiments with heavy prechlorination were not continued for a period sufficienctly long to show whether complete sterilization of rapid-sand filters could be brought about through this means.

[18] See Public Health Reports, Dec. 19, 1930, pp. 3105–3128 (Reprint No. 1434).

EXCESS-LIME TREATMENT

Observations on the bacterial efficiency of excess-lime treatment occupied a period of about seven months in 1928 and 1929.

The results of these experiments indicated that a well-marked bacterial reduction occurs in lime-treated water when the residual pH approaches or exceeds about 10.0, which figure corresponded in the raw water treated (i. e., Ohio River) to 15 or 20 parts per million of causticity. For pH values lower than 10.0 the bactericidal action of excess-lime appeared to become greatly diminished when the pH reached 9.0, or the causticity approached zero. Little or no bactericidal action was evidenced in the absence of causticity, even when monocarbonate alkalinity was present to the extent of 15 or 20 parts per million. These observations were made with a contact period of 6 hours. With longer periods, observations by Bahlman[19] have indicated that a measurable bacterial reduction may be accomplished by carrying a relatively low basicity, with no causticity, in the lime-treated water.

When viewed apart from its function in water softening and considered merely as a chemical method of water disinfection, excess-lime treatment did not appear, in these experiments, to have the extent of advantages possessed by prechlorination. Its main disadvantages, in comparison with prechlorination, were (*a*) its less consistent performance (*b*) the longer period of time required to complete its action, and (*c*) the difficulty experienced in maintaining a high degree of constancy in the residual pH or causticity. As a finished water containing causticity is undesirable, the use of excess-lime treatment for disinfection should be followed by recarbonation in order to adjust the chemical equilibrium of the water to a condition such that it will not cause after-deposits in mains and house fixtures.

From the viewpoint of these studies, the four series of experiments above indicated were of value chiefly in showing the extent to which the efficiency of ordinary rapid-sand filtration systems could be increased through various modifications in prefiltration treatment. They also provided a basis for estimating the degree to which the relationships observed between the bacterial quality of the raw water and the corresponding quality of the effluents of filtration processes would be affected by such modifications in treatment.

RELATIONS OBSERVED BETWEEN QUALITY OF INFLUENT AND EFFLUENT WATERS

Throughout the studies recorded in these reports a consistent relationship has been observed between variations in the bacterial quality of raw or influent waters, as delivered for treatment, and

[19] Bactericidal Action of Lime in Sub-Caustic Doses. C. Bahlman. Rept. Eighth Ann. Ohio Conf. on Water Purification, pp. 56–59.

corresponding variations in the quality of the effluent waters produced from them at various stages of treatment. The importance of this relationship lies in its indication that under conditions of practice, all processes of water purification in current use appear to be sur-

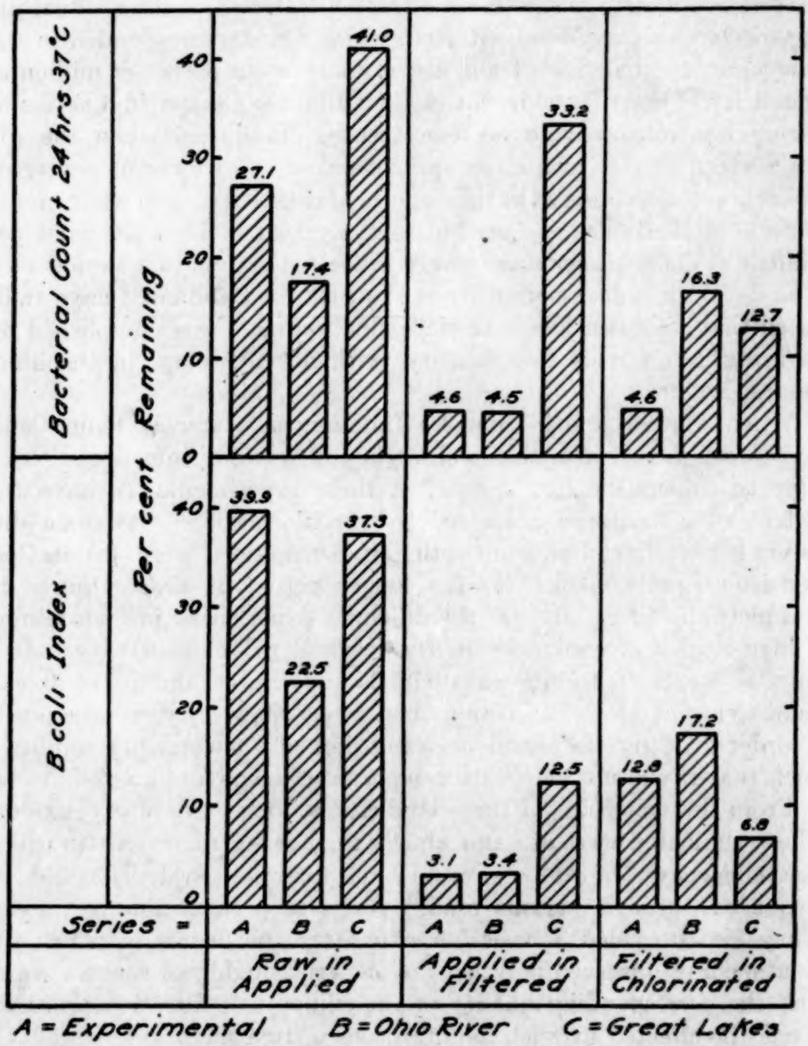

FIGURE 2.—Comparative average percentages of influent water bacteria remaining in the effluents of successive stages of treatment

rounded by definite limitations in respect to the quality of effluents which they can produce with varying degrees of raw-water pollution, and, conversely, to the permissible maximum degree of raw-water pollution consistent with the production of effluents of specified quality.

The consistency with which the relationship in question has been observed in these studies may be more fully appreciated by referring to detailed tabulations given in previous reports.[20] It is sufficient to note here that it was evidenced in the performance data of each one of the 31 municipal filtration plants surveyed and likewise in the corresponding data obtained from the experimental filtration plant throughout its period of operation. In some individual municipal plants it was more apparent than in others, but such a variation

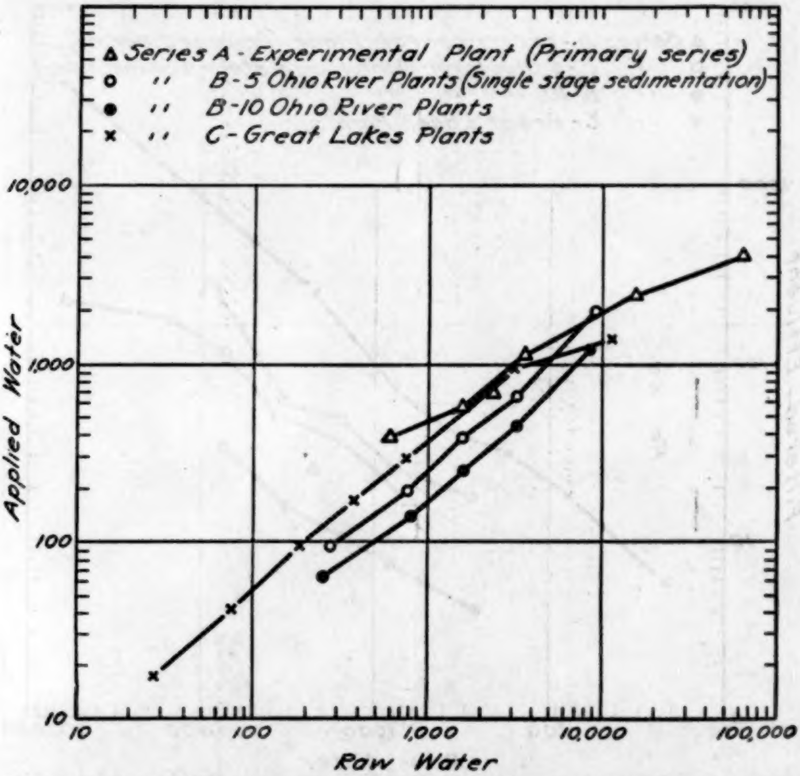

FIGURE 3.—Relations between average numbers of bacteria observed in raw and applied waters. (Bacterial count per cubic centimeter, 24 hours, 37° C.)

would be expected in view of the wide differences in the conditions of operation surrounding these plants.

In order to illustrate graphically the trend of these relationships, Figures 3 to 10, inclusive, have been prepared from average data [21] obtained in the three series of observations indicated in the charts. In the plots designated as Series B, the data from the municipal filtration plants along the Ohio River have been divided into two

[20] See Public Health Bulletin No. 172, Tables 39, 40, 63, 64, and 65; Public Health Bulletin No. 193, Tables 9, 10 and 11; and Reprint No. 1114 (Table No. 1) from Public Health Reports.

[21] See Public Health Bulletin No. 172, Tables 42 and 43; Public Health Bulletin No. 193, Tables 13 and 14; and Reprint No. 1114 (Table No. 1) from Public Health Reports.

subseries, one based on the average performance of the entire group of 10 plants surveyed and the other on that of 5 of these plants equipped with single-stage sedimentation (the remaining 5 plants of this group were provided with double-stage settling basins with decidedly longer total periods of sedimentation).

Two particularly noteworthy characteristics of these plots are their tendencies in a majority of the cases to follow roughly parallel slopes and approximately straight-line trends on the logarithmic

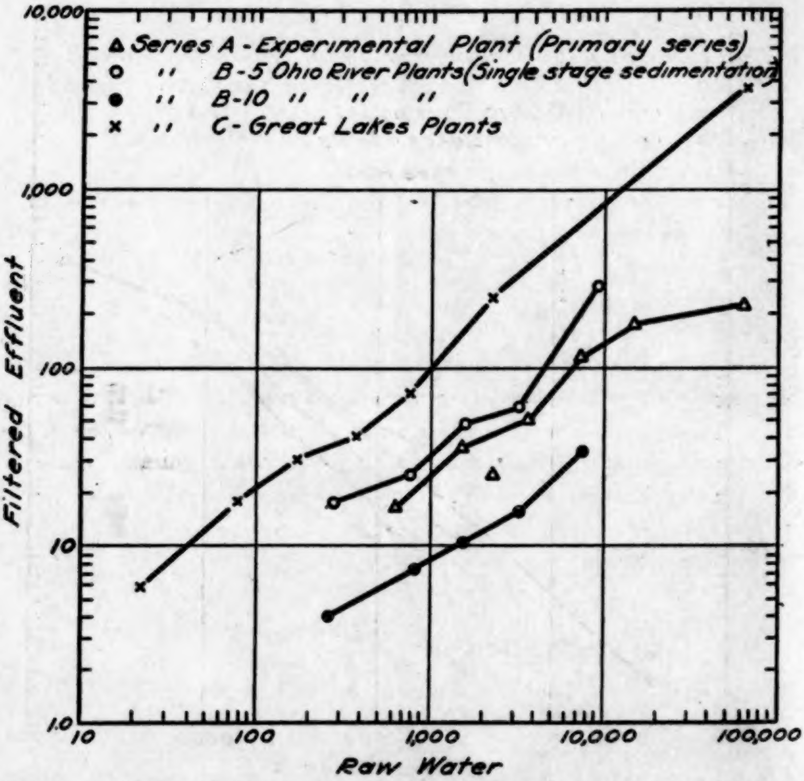

FIGURE 4.—Relations between average numbers of bacteria observed in raw and filtered waters. (Bacterial count per cubic centimeter, 24 hours, 37° C.)

plotting scales used. Although some of the plots show a considerable degree of spread in their relative positions, others appear to follow very nearly the same trend, notably those showing the relations between the bacterial contents of the raw and applied waters and of the unchlorinated and chlorinated waters. The widest degree of variability was indicated in the relative efficiencies of filtration. In the series designated as "B" and "C," they represent the performance of the average Ohio River and Great Lakes plants, respectively.

NATURE OF BACTERIAL RELATIONSHIPS

In previous reports [22] of these studies it has been shown that the relationships observed between the bacterial quality of the raw, or influent, water and the corresponding quality of the effluent obtained from each successive stage of treatment are, in general, linear functions of the logarithms of these two variables, expressed by the straight-line equation:

$$\log E = n \log R + \log c \qquad (3)$$

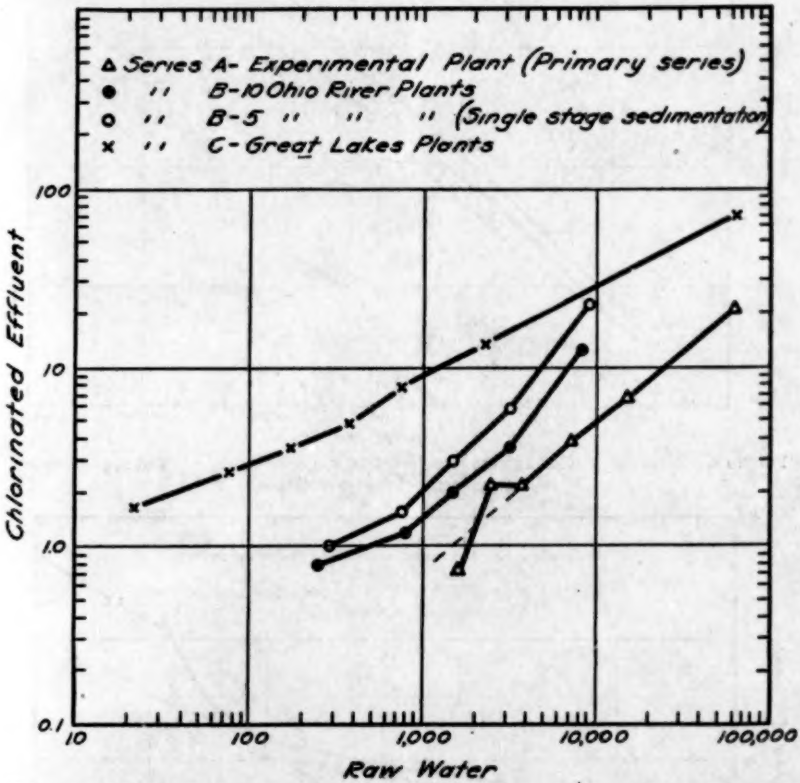

FIGURE 5.—Relations between average numbers of bacteria observed in raw and post-chlorinated waters. (Bacterial count per cubic centimeter, 24 hours, 37° C.)

in which (R) denotes the bacterial content of the raw, or influent water, (E) the corresponding bacterial content of the effluent, and (c) and (n) empirical constants defining, respectively, the value of (E) when (R) equals unity and the linear slope of the straight line representing the relationship between the logarithms of the two variables.

[22] See Public Health Bulletin No. 172, pp. 31-32 and 124-133; Reprint No. 1114 (pp. 12-15) from Public Health Reports; and Public Health Bulletin No. 193, pp. 51-52.

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When this linear equation (3) is cleared of logarithms, the relationship becomes the power function:

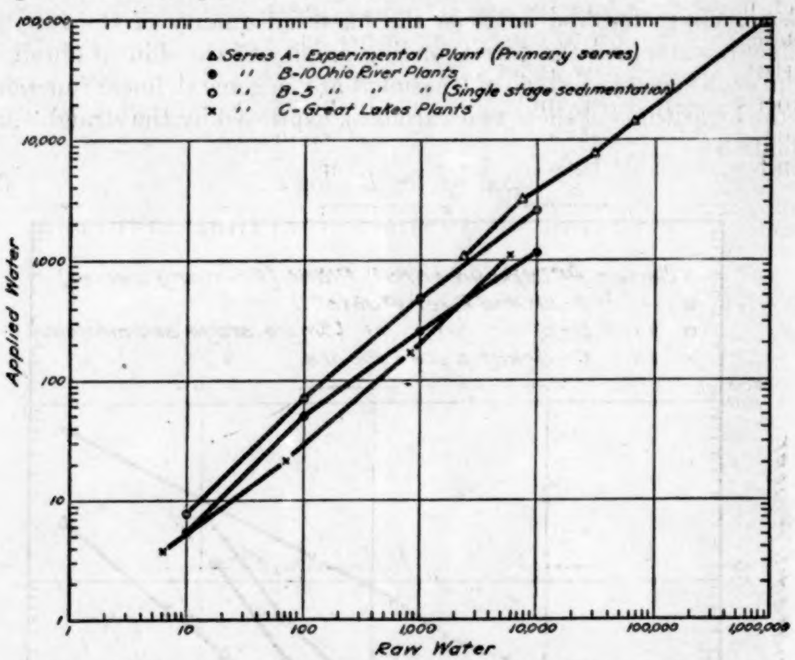

FIGURE 6.—Relations between average numbers of B. coli observed in raw and applied waters. (B. coli index per 100 cubic centimeters)

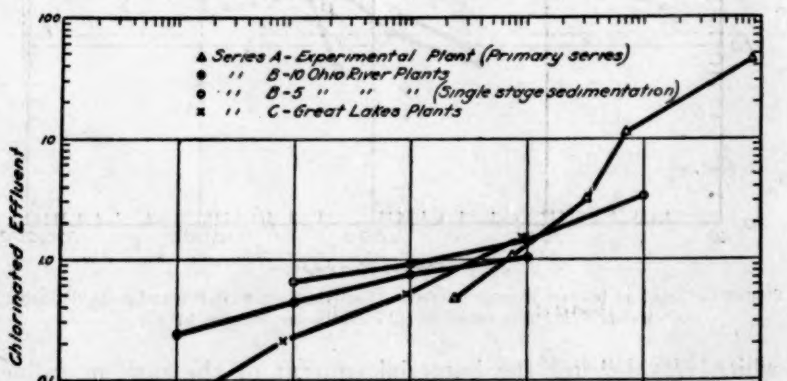

FIGURE 7.—Relations between average numbers of B. coli observed in raw and post-chlorinated waters. (B. coli index per 100 cubic centimeters)

$$E = cR^n \tag{4}$$

in which all of the terms have the same significance as above defined.

The consistency with which the bacterial relationships observed in these studies, both in the performance of the experimental plant and in that of the several individual municipal plants surveyed, tended to conform to this equation has suggested that it constitutes virtually a basic law underlying the performance of water-purification processes in general, applicable alike to individual stages of treatment, such as sedimentation, filtration, and chlorination, and to various combinations of these processes. In this connection it is of interest

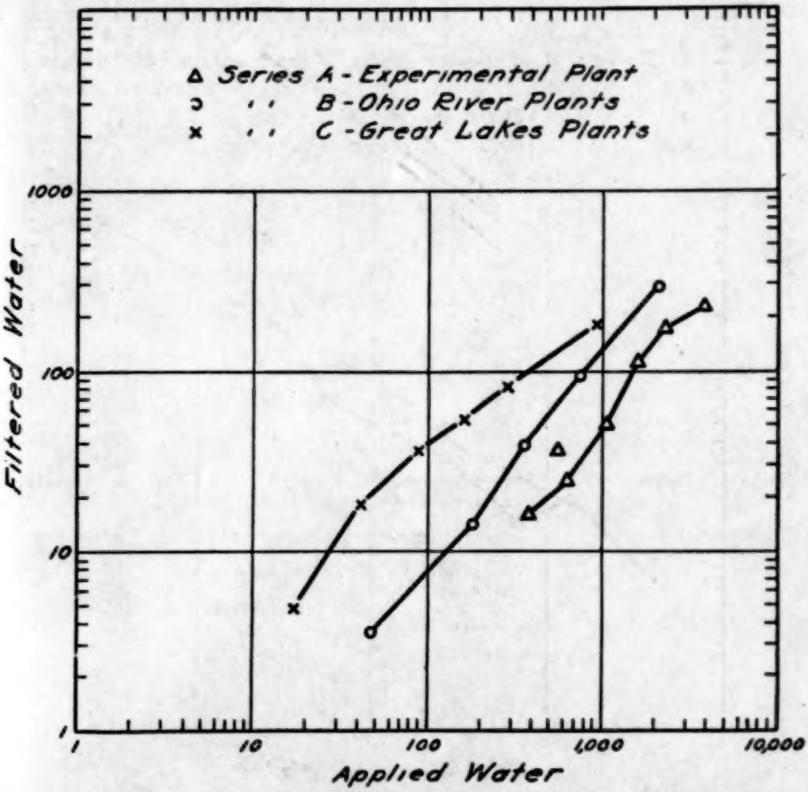

FIGURE 8.—Relations between average numbers of bacteria observed in applied and filtered waters. (Bacterial count per cubic centimeter, 24 hours, 37° C.)

to note that, since the publication of the earlier reports of these studies, the general applicability of this law both to water-purification and to sewage-treatment processes has been confirmed by the observations of Malischewski [23] in Europe.

The close analogy of equation (4) to the well-known Freundlich equation, defining the law governing adsorption phenomena, is both interesting and of possible significance, in view of the consistency with which it appears to express the relationships above described.

[23] Two Laws of Water Purification. N. Malischewski, Gesund. Ing., vol. 52, p. 569, 1929. Abstract in Summary of Current Literature, Water Pollution Research Board (Great Britain), vol. 3, No. 1, January, 1930, No. 16, p. 4.

Although the natures of the several processes involved in water purification differ from each other in their modes of action, such as, for example, in that of sedimentation as contrasted with filtration, all of them are essentially extractive processes and probably subject to laws very similar in their resultant effects to those governing a phenomenon such as adsorption. The practical significance of this principle, in so far as it applies to the performance of water-purification processes, is that although the efficiency of these processes

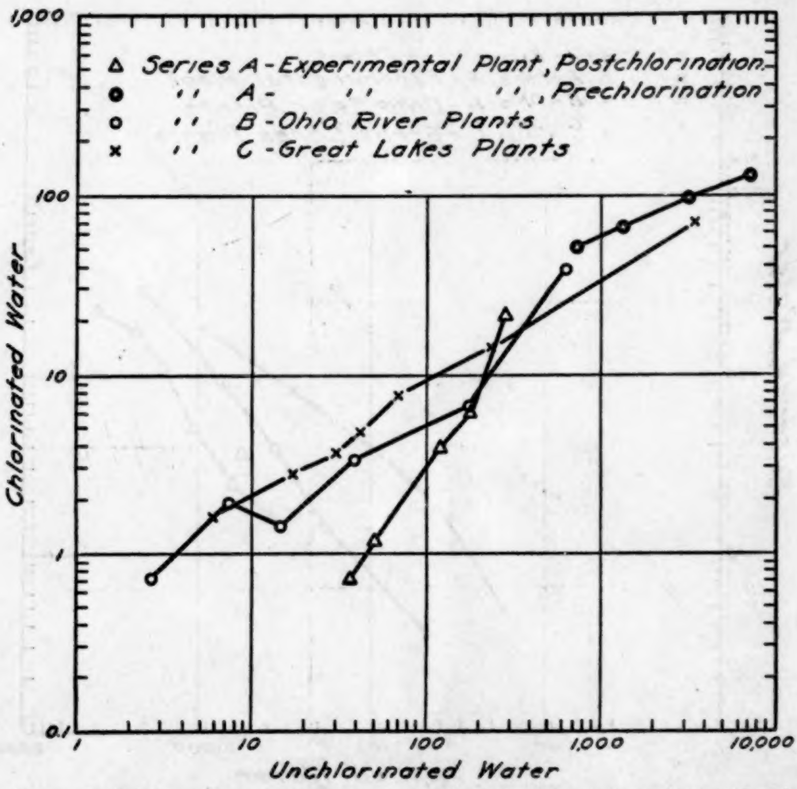

FIGURE 9.—Relations between average numbers of bacteria observed in unchlorinated and chlorinated waters. (Bacterial count per cubic centimeter, 24 hours, 37° C.)

tends, as shown in previous reports, to become increased, under normal conditions of operation, coincidently with an increase in raw or influent water pollution, the former does not appear to be sufficient to offset the latter under ordinary conditions of existing routine practice.

APPLICATION OF BACTERIAL RELATIONSHIPS

The bacterial relationships developed from these studies have been useful both as a means for comparing the performance of different plants, or processes, under similar conditions of bacterial loading and as a basis for estimating either the quality of effluent obtainable from

a raw or influent water of a given degree of bacterial pollution or conversely the limiting density of raw or influent water bacteria within which an effluent of specified quality might be produced, by a particular combination of treatment. The former of these two applications of the data may be readily understood by referring to Figures 3 to 10, inclusive. The latter will be discussed more fully, as it has an important bearing on the main objectives and conclusions of these studies.

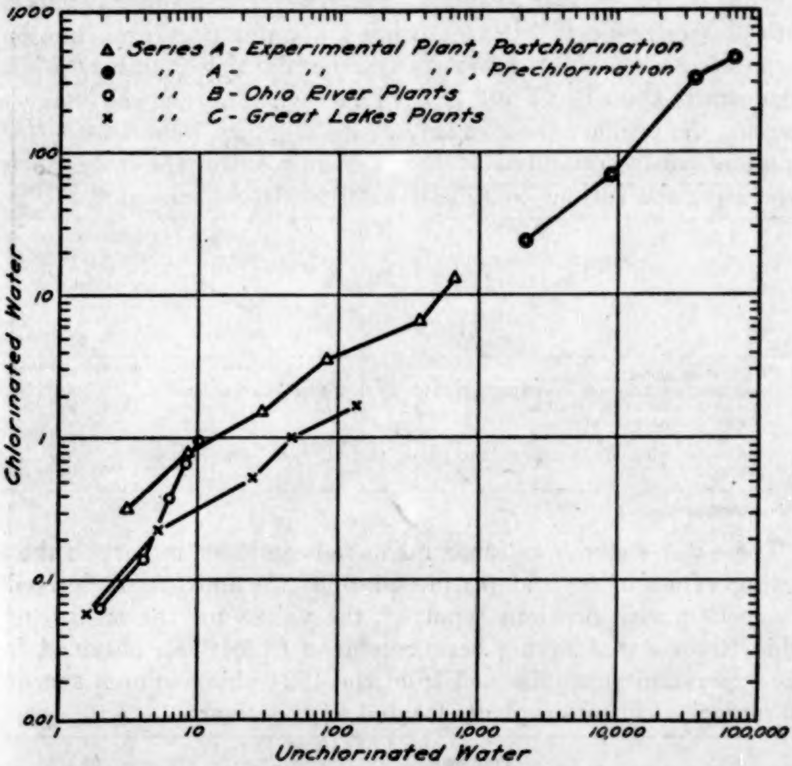

FIGURE 10.—Relations between average numbers of B. coli observed in unchlorinated and chlorinated waters. (B. coli index per 100 cubic centimeters)

A practical test of the validity of these bacterial relationships has been the extent to which they might be utilized for estimating the bacterial content of a raw or of an effluent water corresponding to a known or assumed density in the other of these two variables. In previous reports [24] it has been shown that estimates of this kind, based on derived values of (c) and (n) as given in equations (3) and (4) have yielded average results consistent, within the range of observational error, with those actually recorded at full-scale municipal

[24] See Public Health Bulletin No. 172, pp. 37–39 (Table No. 21); also Public Health Bulletin No. 193, pp. 67–71 (Tables Nos. 18 and 19).

plants under parallel conditions of raw-water pollution. From the general concordance noted between the estimated and observed results in these instances, it has been concluded that properly selected values of (*c*) and (*n*) should permit a reasonably accurate approximation of the maximum permissible density of bacteria in a raw-water consistent with the production of an effluent of specified quality, assuming an average plant of a given type and degree of elaboration, treating water from a given general source.

From several series of estimates of the character made in connection with previous reports [25] the following raw-water *B. coli* maxima have been selected as best representing the limiting numbers of this organism in Ohio River and Great Lakes waters, from which effluents meeting the primary requirement of the Treasury Department *B. coli* standard can be produced by the average plant of the more efficient type using the various combinations of treatment indicated:

Treatment	Limiting raw-water *B. coli* index per 100 c. c. (round numbers)	
	Ohio River	Great Lakes
(1) Chlorination alone	80	50
(2) Coagulation, sedimentation, and rapid-sand filtration (without chlorination)	80	60
(3) Same as (2) with prechlorination	3,500	(1)
(4) Same as (2) with postchlorination	6,000	4,500
(5) Same as (2) with both prechlorination and postchlorination	20,000	(1)
(6) Same as (4) with double-stage sedimentation (relatively long sedimentation period)	60,000	(1)

1 No observations.

These raw-water *B. coli* maxima have been based in part on the following values of (*c*) and (*n*) in equations (3) and (4), as derived in connection with previous reports,[26] the values for the treatment of Ohio River water having been combined from those obtained from the experimental studies and from the 1924 observational survey of 10 municipal filtration plants located on this river:

Treatment	(*c*)	(*n*)
(1) Chlorination alone:		
(*a*) Ohio River	0.015	0.96
(*b*) Great Lakes	0.050	0.76
(2) Coagulation, sedimentation and rapid-sand filtration, without chlorination:		
(*a*) Ohio River	0.070	0.60
(*b*) Great Lakes	0.087	0.60
(3) Same as (2), with post-chlorination:		
(*a*) Ohio River	0.011	0.52
(*b*) Great Lakes	0.040	1 0.38
(4) Same as (3), with double-stage sedimentation (relatively long sedimentation period)	0.064	0.25

1 The more precise figure is 0.383.

NOTE.—For rapid-sand filtration treatment with prechlorination, the raw-water maxima were derived directly from the plot shown in fig. 8, in Reprint No. 1434 from Public Health Reports.

25 See Public Health Bulletin No. 172, pp. 36–39, 136–143, and 212–213; Public Health Bulletin No. 193, pp. 71–72 and 85–86; and Reprint No. 1114 (pp. 23–24), Reprint No. 1392 (p. 15), and Reprint No. 1434 (pp. 15–17) from Public Health Reports.

26 See Public Health Bulletin No. 172, pp. 131–133; Public Health Bulletin No. 193, pp. 61–64 and 71; and Reprint No. 1114 (p. 14) from Public Health Reports.

It is of interest to note, in connection with the raw-water *B. coli* maxima above given, that the deviation shown between the two sets of corresponding figures (i. e., for the treatment of Ohio River and Great Lakes waters, respectively) was so small as to fall virtually within the range of observational error. For all practical purposes a single rounded mean could be applied in each case to the treatment of water from both general sources. It also is noteworthy that the raw-water maxima observed for chlorination alone and for ordinary rapid-sand filtration treatment without chlorination were practically the same, though the various combinations of these two processes gave much higher limiting figures than did either one considered separately.

It perhaps is well to emphasize that the limiting *B. coli* figures stated, as well as the values of (*c*) and (*n*) from which they have been derived, have been based on the combined average performance of the experimental plant (in the case of Ohio River water) and of the more efficient of the two groups of municipal plants surveyed, consisting of about one-half of the total in each group. They represent, therefore, the performance of the average plant of the more efficient type, rather than that of the average plant of the entire list of plants studied. If these data were applied to a large group of plants having the usual wide range of diversity in their efficiencies, some of the plants of such a group doubtless could treat successfully a raw water more highly polluted than indicated by the *B. coli* maxima above given, and other plants of the same group would have, on the other hand, great difficulty in treating such a water. Unless the efficiency of a given plant happened to fall very near to that of the average plant of the more efficient type from which these data have been derived, a bacterial relationship curve based on its performance probably would give values of (*c*) and (*n*) diverging considerably from those above stated. These limiting conditions should be borne clearly in mind in undertaking to apply the results of these studies to the performance of individual water-purification systems.

GENERAL CONCLUSIONS

The studies described in these reports have justified certain general conclusions, which may be stated very briefly as follows:

(1) The results obtained from the studies appear to be fairly representative of those which may be expected, under normal conditions of practice, from the average process or plant of the types observed, when treating waters similar to those of the Ohio River and Great Lakes, respectively.

(2) Although the efficiencies of some individual water-purification plants have been found to vary considerably among themselves, the average efficiencies of groups of plants have shown a very fair degree of mutual consistency, even in the treatment of raw waters taken

from different general sources. The divergences in this respect noted as between the average plants treating Ohio River and Great Lakes waters, respectively, though measurable, have not appeared significantly great. In many instances diversities in performance as between individual plants have been related definitely to variations in certain features of plant design. In a few cases no reason could be assigned for such differences.

(3) The relationships observed between raw or influent waters and effluent waters in respect to concurrent variations in their bacterial quality appear to be governed by a fundamental law, characteristic of all processes of water purification and simulating adsorption phenomena in its effects. The restrictions imposed by such a law on the efficiency of bacterial removal are such as to limit the average quality of effluent obtainable by a particular combination of treatment from a raw water of a given average degree of pollution and, conversely, the maximum pollution of a raw water from which an effluent of specified average quality can be produced.

(4) The efficiency of the ordinary more simple processes of water purification can be increased very measurably by means of certain modifications and elaborations in prefiltration treatment, notably by prechlorination, by longer periods of sedimentation, and by improved coagulation resulting from such measures as pH control and the more liberal dosage of coagulants. Similar results doubtless can be obtained by modifications and elaborations other than those included in these studies.

The opportunities afforded during this investigation for observing the natural purification efficiency of prolonged storage of water prior to artificial treatment were very limited, but they were sufficient to point very clearly to the advantages inherent in this process, as a measure for effecting a preliminary improvement in the physical and the bacterial quality of highly polluted waters. The possibilities of this method, either through the construction of storage reservoirs or the impounding of water in flowing streams, have not thus far been fully utilized in this country, though they are widely recognized in certain European countries, notably in England, where storage is practiced extensively in connection with artificial water treatment. Although the difficulty and expense involved in providing long storage of water doubtless would be great in many instances, particularly in the level sections of the Middle West, its feasibility has been demonstrated even under such relatively unfavorable circumstances. It will be used more generally in the future than in the past, as its great advantages become more fully appreciated.

It appears to be the opinion of some water-purification specialists that virtually no limit exists as to the degree of raw-water pollution which can be successfully dealt with by a sufficiently elaborated

combination of water-treatment processes now available. Particularly noteworthy is this sentiment among advocates of highly intensified methods of chlorination such as have been developed during recent years. Although such a result is theoretically possible and has been producible on an experimental scale, the practical difficulties standing in the way of its attainment in routine large-scale water-purification operations are well exemplified by the observations made, in the course of these studies, of the actual performance of 31 municipal water-filtration plants, a large majority of which are required to handle raw waters of high and widely variable degrees of pollution. In no instance has conclusive evidence been afforded that these plants could produce effluents of satisfactory potability and sanitary quality from raw waters of unlimited degree of pollution. Moreover, the results of the experimental studies recorded in previous reports of this series have pointed clearly to the operation of a law of diminishing returns in the efficiency of multiplied processes of water purification. Although such multiplication appears to assure increased stability of performance in dealing with raw waters of highly variable quality, it exacts a penalty in a diminished efficiency of certain individual stages of treatment. These limitations should be taken into account in estimating the net advantages to be gained through elaborations involving multiple-stage treatment.

Finally, it may be noted that the restrictions which may be expected ultimately to govern the maximum permissible degree of pollution of sources of purified-water supplies in the industrial areas of this country may prove to be conditioned more largely by the growing difficulties experienced in obtaining treated effluents of acceptable palatability and wholesomeness for domestic use than by considerations affecting merely the bacterial quality of such effluents. In this connection, the possible relation of water-borne outbreaks of gastro-intestinal disturbances to the presence of chemically or biologically toxic substances in purified-water supplies, derived from sources highly polluted by sewage and certain kinds of industrial wastes, can not be wholly discarded, in view of the history of such outbreaks during the recent period of drought. Although the prevalence of urban typhoid fever has been reduced to a point such that it is now a minor cause of death, the occurrence of 242 water-borne outbreaks of this disease in the United States during the decade 1920–29, as recorded recently by Wolman and Gorman,[27] indicates that it has not been eliminated as a definite hazard. As 49 of the outbreaks thus recorded were due to failures of water treatment, it is evident that the mere existence of purification facilities has not conferred immunity from this disease.

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[27] Am. Jour. of Pub. Health, vol. 21, No. 2, pp. 115–129 (Feb., 1931).

Future developments in the reinforcement of water-purification systems which may have to deal with raw waters taken from excessively polluted sources probably will tend to follow present lines, notably in the direction of intensified chlorination and the further elaboration and improvement of preliminary treatment of water. Storage, both natural and artificial, will assume a rôle of increasing importance in these developments. Treatment of sewage and of certain kinds of industrial wastes likewise will receive more attention as special measures of protection for sources of water supply. Further studies of the relative values of these several measures are needed, preferably along the general lines of combined observation and experiment such as have been followed in these studies. The present investigation has afforded a definite answer to the major questions involved in determining the limitations of current methods of water purification, in so far as the areas embraced by the survey are concerned. The study should be extended eventually to embrace those broader measures of protection, such as above noted, which have not been included in its more immediate field. The weaker links of water purification should receive more attention, as they doubtless hold the key to many of those lapses and variations in efficiency which thus far remain unexplained. From every angle other than those indicated, these studies may be considered as having been brought to a satisfactory conclusion.

COURT DECISION RELATING TO PUBLIC HEALTH

Law regulating barbering held constitutional and construed.—(Georgia Supreme Court; State Board of Barber Examiners et al. *v.* Blocker et al., 167 S. E. 298; decided Dec. 15, 1932.) An equitable petition was brought by two "beauticians" against the State board of barber examiners and certain other State officials to enjoin the enforcement against the plaintiffs of the statute regulating barbering and to have such law declared unconstitutional and void. The barber law was originally enacted in 1914 and was amended in 1920 and 1931. In the case of Cooper *v.* Rollins, 152 Ga. 588, 110 S. E. 726, 20 A. L. R. 1105, decided in 1922 by the Supreme Court of Georgia, the then existing law had been held constitutional. The court held that the principles there applied, with respect to constitutionality, were controlling in the instant case, and also declared that other attacks on the constitutionality of the 1931 amendatory act were without merit.

The court also held, adversely to the plaintiffs' contention, that "beauticians," beauty culture specialists, beauty culturists, hairdressers, and operators of beauty shops were subject to the barber

law. This holding was based on the following definition, contained in the 1931 act:

To shave or trim the beard, cut or dress the hair, to give facial or scalp massaging, facial or scalp treatment with oils or creams and other preparations made for this purpose, either by hand or mechanical appliances, to singe and shampoo the hair, or to dye the hair, of any living person for hire or pay shall be considered as practicing the profession of a barber within the meaning of this act.

DEATHS DURING WEEK ENDED MARCH 25, 1933

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Mar. 25, 1933	Corresponding week, 1932
Data from 85 large cities of the United States:		
Total deaths	8,373	9,472
Deaths per 1,000 population, annual basis	11.7	13.5
Deaths under 1 year of age	607	687
Deaths under 1 year of age per 1,000 estimated live births [1]	53	57
Deaths per 1,000 population, annual basis, first 12 weeks of year	12.3	12.6
Data from industrial insurance companies:		
Policies in force	68,730,271	73,749,858
Number of death claims	14,138	14,302
Death claims per 1,000 policies in force, annual rate	10.7	10.1
Death claims per 1,000 policies, first 12 weeks of year, annual rate	11.2	10.2

[1] 1933, 81 cities; 1932, 80 cities.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers

Reports for Weeks Ended April 1, 1933, and April 2, 1932

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended April 1, 1933, and April 2, 1932

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Apr. 1, 1933	Week ended Apr. 2, 1932	Week ended Apr. 1, 1933	Week ended Apr. 2, 1932	Week ended Apr. 1, 1933	Week ended Apr. 2, 1932	Week ended Apr. 1, 1933	Week ended Apr. 2, 1932
New England States:								
Maine	5		4	204		184	0	2
New Hampshire						1	0	0
Vermont	1				14	110	0	0
Massachusetts	15	46	6	15	307	660	1	2
Rhode Island	3	6	2	1		292	0	1
Connecticut	10	3	11	58	214	181	0	1
Middle Atlantic States:								
New York	67	94	[1] 37	[1] 113	4,317	2,314	3	13
New Jersey	22	29	20	89	1,882	352	4	3
Pennsylvania	52	119			1,818	2,203	7	11
East North Central States:								
Ohio	45	59	194	390	821	2,740	3	10
Indiana	18	19	43	272	134	73	7	12
Illinois	43	61	80	126	575	489	17	9
Michigan	19	24	3	52	1,256	1,098	2	8
Wisconsin	3	8	59	576	387	1,159	3	2
West North Central States:								
Minnesota	13	12	3	1	1,187	40	0	2
Iowa	4	11			11	3	2	1
Missouri	25	32	8	31	233	55	0	1
North Dakota		4			14	9	0	1
South Dakota		6		5	7	19	6	3
Nebraska	8	10		6	24	4	1	2
Kansas	5	18		10	316	344	1	0
South Atlantic States:								
Delaware	4	1		6	13		0	0
Maryland [3]	9	12	18	313	53	17	1	2
District of Columbia	4	11	1	32	4	3	0	2
Virginia [3]	11				380		2	1
West Virginia	13	17	33	335	117	414	1	2
North Carolina	12	18	23	162	600	565	1	2
South Carolina	8	7	434	2,081	269	38	0	0
Georgia [3]	11	8	96	177	81	14	3	1
Florida	12	6	12	14	53	5	0	0
East South Central States:								
Kentucky	12	19	24	788	99	85	2	2
Tennessee	12	10	156	837	80	213	4	3
Alabama [3]	8	18	37	537	66	5	0	1
Mississippi	6	3					0	0
West South Central States:								
Arkansas	7	8	39	252	144	3	1	0
Louisiana	7	29	11	36	104	236	1	0
Oklahoma [4]	7	23	78	422	88	24	3	3
Texas [3]	104	35	290	247	1,209	32	3	0

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended April 1, 1933, and April 2, 1932—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Apr. 1, 1933	Week ended Apr. 2, 1932	Week ended Apr. 1, 1933	Week ended Apr. 2, 1932	Week ended Apr. 1, 1933	Week ended Apr. 2, 1932	Week ended Apr. 1, 1933	Week ended Apr. 2, 1932
Mountain States:								
Montana	1	1	9	3	33	178	1	1
Idaho	------	2	------	1	20	------	0	0
Wyoming	------	1	------	1	2	7	0	1
Colorado	5	5	31	------	12	118	1	3
New Mexico	2	6	16	2	4	53	1	0
Arizona	5	1	------	46	41	3	0	0
Utah [3]	6	2	------	------	1	2	1	0
Pacific States:								
Washington	8	------	------	3	64	523	1	1
Oregon	1	3	31	94	72	214	0	0
California [3]	39	59	52	91	1,272	658	5	3
Total	672	866	1,861	8,429	18,398	15,740	89	112

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Apr. 1, 1933	Week ended Apr. 2, 1932	Week ended Apr. 1, 1933	Week ended Apr. 2, 1932	Week ended Apr. 1, 1933	Week ended Apr. 2, 1932	Week ended Apr. 1, 1933	Week ended Apr. 2, 1932
New England States:								
Maine	0	0	26	31	0	0	1	1
New Hampshire	0	0	19	29	0	0	0	0
Vermont	0	0	11	4	1	4	0	0
Massachusetts	0	2	53	520	0	0	3	1
Rhode Island	0	0	37	52	0	0	0	0
Connecticut	0	0	167	99	1	1	2	0
Middle Atlantic States:								
New York	0	0	1,120	1,527	0	3	3	6
New Jersey	0	1	377	313	1	0	3	3
Pennsylvania	1	2	1,090	1,190	0	0	5	8
East North Central States:								
Ohio	1	1	1,538	557	29	29	2	1
Indiana	1	1	265	199	1	5	3	0
Illinois	0	1	565	335	15	6	4	9
Michigan	0	1	673	492	1	10	4	10
Wisconsin	0	2	124	93	17	3	1	1
West North Central States:								
Minnesota	0	0	107	110	0	3	2	1
Iowa	1	1	31	54	22	11	0	1
Missouri	0	0	87	73	0	2	1	2
North Dakota	1	0	11	14	0	6	0	2
South Dakota	0	0	6	11	0	7	4	2
Nebraska	0	0	20	36	0	11	0	0
Kansas	1	1	67	58	0	14	1	0
South Atlantic States:								
Delaware	0	0	12	20	0	0	0	0
Maryland [3]	0	0	117	132	0	0	4	3
District of Columbia	0	0	17	32	0	0	0	1
Virginia [3]	0	1	43	------	0	------	3	------
West Virginia	0	1	39	44	0	1	3	6
North Carolina	0	0	53	58	1	1	3	3
South Carolina	0	0	3	11	1	0	6	7
Georgia [3]	0	0	8	10	4	0	8	24
Florida	0	1	15	9	0	0	22	2
East South Central States:								
Kentucky	0	0	70	128	1	2	7	11
Tennessee	0	0	39	50	0	41	4	5
Alabama [3]	0	0	14	19	1	18	5	3
Mississippi	0	0	2	17	0	29	7	4
West South Central States:								
Arkansas	0	0	8	3	3	19	2	0
Louisiana	0	0	13	12	1	3	21	14
Oklahoma [4]	1	0	18	28	2	63	5	4
Texas [3]	0	0	86	53	39	37	16	3

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended April 1, 1933, and April 2, 1932—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Apr. 1, 1933	Week ended Apr. 2, 1932	Week ended Apr. 1, 1933	Week ended Apr. 2, 1932	Week ended Apr. 1, 1933	Week ended Apr. 2, 1932	Week ended Apr. 1, 1933	Week ended Apr. 2, 1932
Mountain States:								
Montana	1	0	10	36	0	0	0	0
Idaho	0	0	1	6	4	1	3	1
Wyoming	0	0	14	7	0	4	3	1
Colorado	0	0	68	39	6	0	2	1
New Mexico	0	0	8	11	0	0	5	0
Arizona	0	0	21	13	0	0	2	1
Utah [2]	0	0	6	6	0	0	0	0
Pacific States:								
Washington	1	1	53	26	2	25	0	3
Oregon	0	0	21	13	10	9	2	0
California [5]	2	4	167	152	50	15	2	8
Total	11	21	7,320	6,732	213	383	174	153

[1] New York City only.
[2] Week ended Friday.
[3] Typhus fever, week ended Apr. 1, 1933, 13 cases: 1 case in Virginia, 4 cases in Georgia, 4 cases in Alabama, and 4 cases in Texas.
[4] Figures for 1933 are exclusive of Oklahoma City and Tulsa, and for 1932 are exclusive of Tulsa only.
[5] Rocky Mountain spotted fever, week ended Apr. 1, 1933, 1 case in California.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
January, 1933										
Missouri	13	166	467	1	351		0	444	4	7
February, 1933										
Alabama	4	86	847	24	46	13	2	81	18	10
District of Columbia	3	31	18		14		0	47	0	1
Florida	2	36	694	6	41	3	0	33	0	21
Idaho		5	10		353		0	14	118	2
Kansas	4	37	97		1,051		0	260	5	4
Louisiana	7	65	82	6	135	11	2	28	4	28
Missouri	16	136	116		708			434	2	13
Montana	1	5	706		673		0	84	2	19
Oklahoma [1]	8	56	847	25	80	5	1	85	9	12
Texas	6	280	1,482	219		23	2	214		28
Virginia	11	77	4,296	6	1,680	4	0	166	0	19
Washington	2	26	44		101		2	227	21	7
Wisconsin	4	18	1,106		1,422		5	496	50	6

[1] Exclusive of Oklahoma City and Tulsa.

January, 1933

Missouri:	Cases
Chicken pox	393
Dysentery	2
Mumps	175
Septic sore throat	3
Tularaemia	6
Undulant fever	8
Whooping cough	2

February, 1933

Actinomycosis:	Cases
Kansas	1
Chicken pox:	
Alabama	91
District of Columbia	139
Florida	107
Idaho	46
Kansas	739

Chicken pox—Continued.	Cases
Louisiana	16
Missouri	344
Montana	116
Oklahoma [1]	34
Virginia	389
Washington	592
Wisconsin	1,922

[1] Exclusive of Oklahoma City and Tulsa.

Disease and State	Cases
Conjunctivitis:	
Oklahoma [1]	2
Diarrhea and dysentery:	
Virginia	55
Dysentery:	
Florida	3
Oklahoma [1]	1
Food poisoning:	
Montana	2
German measles:	
Kansas	2
Montana	1
Washington	15
Wisconsin	38
Hookworm disease:	
Louisiana	10
Impetigo contagiosa:	
Montana	13
Lethargic encephalitis:	
Alabama	10
Kansas	1
Louisiana	1
Montana	1
Texas	5
Virginia	6
Wisconsin	1
Mumps:	
Alabama	155
Florida	6
Idaho	24
Kansas	730
Louisiana	5
Missouri	259
Montana	42
Oklahoma [1]	53
Washington	107
Wisconsin	377
Ophthalmia neonatorum:	
Oklahoma [1]	1
Virginia	1
Paratyphoid fever:	
Kansas	1
Texas	6
Virginia	2
Rabies in animals:	
Louisiana	18
Missouri	4
Washington	4
Scabies:	
Montana	2
Oklahoma [1]	1
Septic sore throat:	
Louisiana	1
Missouri	5
Montana	3
Oklahoma [1]	23
Virginia	27
Washington	4
Tetanus:	
Kansas	1
Louisiana	1
Oklahoma [1]	1
Virginia	2
Trachoma:	
Alabama	1
Oklahoma [1]	4
Virginia	1
Trench mouth:	
Kansas	4
Oklahoma [1]	1
Tularaemia:	
Alabama	3
Florida	1
Tularaemia—Continued.	
Louisiana	4
Oklahoma [1]	3
Virginia	5
Typhus fever:	
Alabama	6
Florida	1
Louisiana	1
Virginia	2
Undulant fever:	
Alabama	1
Kansas	1
Louisiana	1
Missouri	2
Virginia	4
Washington	4
Wisconsin	2
Vincent's angina:	
Montana	1
Vincent's infection:	
Washington	1
Whooping cough:	
Alabama	198
District of Columbia	11
Florida	43
Idaho	18
Kansas	144
Louisiana	91
Missouri	76
Montana	19
Oklahoma [1]	49
Virginia	259
Washington	30
Wisconsin	543

[1] Exclusive of Oklahoma City and Tulsa.

WEEKLY REPORTS FROM CITIES

City reports for week ended March 25, 1933

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0		0	0	2	2	0	0	1	15	23
New Hampshire:											
Concord	0		0	0	2	1	0	0	0	0	12
Manchester	0		0	0	5	6	0	1	0	0	26
Nashua	0		0	0	0	0	0	0	0	0	
Vermont:											
Barre	0		0	0	0	0	0	0	0	0	1
Burlington	0		0	0	0	2	0	0	0	0	11
Massachusetts:											
Boston	5	2	1	92	18	81	0	9	0	92	227
Fall River	0	1	1	0	5	12	0	3	0	7	37
Springfield	0		0	3	1	15	0	0	0	31	38
Worcester	1	1	0	5	2	19	0	0	0	15	58
Rhode Island:											
Pawtucket	0		0	0	0	2	0	0	0	0	
Providence	1	1	0	0	4	13	0	2	0	31	75
Connecticut:											
Bridgeport	0	3	1	24	2	13	0	3	0	0	30
Hartford	2	1	0	5	5	22	0	1	0	5	40
New Haven	0		0	3	1	8	0	0	0	8	42
New York:											
Buffalo	9		2	41	24	68	0	8	0	36	136
New York	56	36	17	2,359	200	355	0	88	6	109	1,619
Rochester	0		0	4	4	15	0	1	0	13	73
Syracuse	0		0	0	4	37	0	2	0	7	52
New Jersey:											
Camden	1		0	1	4	7	0	1	0	0	31
Newark	1	5	0	521	10	44	0	9	0	29	99
Trenton	0		0	52	7	11	0	1	3	2	35
Pennsylvania:											
Philadelphia	4	13	6	121	45	135	0	20	1	8	462
Pittsburgh	6	2	1	3	12	54	0	7	0	15	144
Reading	1		0	66	1	16	0	1	0	4	23

City reports for week ended March 25, 1933—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Ohio:											
Cincinnati	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Cleveland	4	79	1	3	20	244	0	14	0	35	207
Columbus	1	2	2	62	3	11	0	4	0	3	70
Toledo	5	1	1	330	10	110	0	0	0	3	76
Indiana:											
Fort Wayne	9	-------	0	0	3	8	0	0	0	0	21
Indianapolis	4	-------	0	93	6	26	0	3	0	5	-------
South Bend	0	-------	0	3	1	6	0	1	0	2	20
Terre Haute	0	-------	0	0	2	10	0	0	0	2	20
Illinois:											
Chicago	7	4	4	350	62	319	0	23	0	21	-------
Springfield	0	3	0	0	2	4	0	0	0	2	21
Michigan:											
Detroit	15	1	4	621	19	195	0	21	1	66	281
Flint	0	5	1	108	4	11	0	0	0	6	29
Grand Rapids	0	-------	0	6	1	14	0	2	0	28	38
Wisconsin:											
Kenosha	0	-------	0	0	0	7	8	0	0	6	10
Madison	0	-------	-------	133	-------	1	0	-------	0	1	-------
Milwaukee	0	1	1	1	6	32	0	4	0	48	111
Racine	0	-------	0	0	0	3	0	0	0	11	11
Superior	0	-------	0	3	0	1	0	0	0	11	5
Minnesota:											
Duluth	0	-------	0	4	1	0	0	2	0	73	11
Minneapolis	0	-------	3	401	13	48	0	7	0	21	98
St. Paul	0	-------	0	797	7	25	0	4	0	62	79
Iowa:											
Des Moines	2	-------	-------	0	-------	7	0	-------	0	0	32
Sioux City	0	-------	-------	0	-------	3	0	-------	0	3	-------
Waterloo	0	-------	-------	1	-------	2	0	-------	0	1	-------
Missouri:											
Kansas City	2	-------	1	144	14	35	0	17	0	0	86
St. Joseph	0	-------	0	12	7	0	0	1	0	3	24
St. Louis	14	1	-------	21	9	13	0	14	2	1	214
North Dakota:											
Fargo	0	-------	1	1	1	0	0	0	0	0	9
Grand Forks	0	-------	0	0	0	2	0	0	0	0	-------
South Dakota:											
Aberdeen	0	-------	0	1	0	4	0	0	0	0	-------
Nebraska:											
Omaha	3	-------	0	22	4	8	0	4	0	1	51
Kansas:											
Topeka	0	-------	0	135	5	0	0	0	0	0	25
Wichita	0	-------	0	0	3	3	0	0	0	7	24
Delaware:											
Wilmington	0	-------	0	7	1	9	0	1	0	0	27
Maryland:											
Baltimore	5	7	2	5	28	70	0	13	0	14	210
Cumberland	0	-------	0	0	2	0	0	1	0	0	9
Frederick	0	-------	0	0	0	0	0	0	0	0	1
District of Columbia:											
Washington	2	1	1	5	19	15	0	16	1	6	160
Virginia:											
Lynchburg	0	-------	0	4	0	1	0	2	0	3	13
Norfolk	0	-------	0	5	3	7	0	2	0	16	34
Richmond	0	-------	0	0	3	7	0	4	0	0	35
Roanoke	0	-------	0	152	4	1	0	0	0	0	22
West Virginia:											
Charleston	1	1	1	0	3	0	0	0	1	0	14
Huntington	2	-------	-------	7	-------	1	0	-------	0	0	-------
Wheeling	0	-------	0	17	0	7	0	0	0	4	17
North Carolina:											
Raleigh	0	-------	0	0	2	0	0	0	0	1	13
Wilmington	1	-------	0	105	2	0	0	0	0	0	6
Winston-Salem	0	-------	0	2	0	6	0	2	0	2	8
South Carolina:											
Charleston	1	13	0	0	3	0	0	0	0	4	19
Columbia	0	-------	0	0	0	0	0	1	0	0	8
Georgia:											
Atlanta	2	28	1	35	10	0	0	1	0	22	65
Brunswick	0	-------	0	0	0	0	0	0	1	0	3
Savannah	1	110	0	0	7	1	0	2	0	0	32
Florida:								0			
Miami	0	-------	2	0	1	0	0		1	5	29
Tampa	0	1	1	0	1	0	0	1	1	6	25

City reports for week ended March 25, 1933—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Kentucky:											
Ashland	0	-------	0	17	0	0	0	0	0	0	-------
Lexington	0	5	0	4	2	2	0	2	0	0	16
Louisville	1	1	1	0	17	26	0	3	0	1	83
Tennessee:											
Memphis	0	-------	3	15	8	3	0	5	0	10	70
Nashville	0	-------	4	0	3	1	0	2	0	0	61
Alabama:											
Birmingham	0	14	0	4	5	2	0	4	2	5	54
Mobile	0	-------	1	5	4	2	0	4	0	0	24
Montgomery	0	-------	-------	0	-------		0	-------	0	2	-------
Arkansas:											
Fort Smith	0	-------	-------	1	-------	0	0	-------	0	1	-------
Little Rock	1	-------	0	18	2	0	0	1	0	0	3
Louisiana:											
New Orleans	9	9	7	11	9	4	0	12	0	1	160
Shreveport	0	-------	0	0	5	3	0	1	0	0	32
Oklahoma:											
Oklahoma City	0	56	0	0	8	0	0	2	0	0	40
Tulsa	0	-------	0	26	0	1	0	0	0	4	-------
Texas:											
Dallas	4	-------	0	-------	5	8	0	7	1	2	70
Fort Worth	1	-------	2	113	7	3	0	1	1	0	40
Galveston	2	-------	0	1	2	1	0	0	2	0	13
Houston	3	-------	1	10	11	0	2	5	0	0	73
San Antonio	3	-------	6	19	8	1	0	7	2	1	64
Montana:											
Billings	0	-------	0	0	0	0	0	0	0	0	8
Great Falls	0	-------	0	2	1	1	0	0	0	5	13
Helena	0	-------	0	0	0	0	0	0	0	0	2
Missoula	0	-------	0	0	0	0	0	0	0	0	3
Idaho:											
Boise	0	-------	0	20	0	0	2	0	0	0	8
Colorado:											
Denver	1	31	0	5	6	13	0	4	1	2	70
Pueblo	1	-------	0	0	0	2	0	1	0	1	9
New Mexico:											
Albuquerque	1	-------	0	0	0	1	0	4	0	4	12
Arizona:											
Phoenix	0	-------	0	15	1	3	0	4	0	0	-------
Utah:											
Salt Lake City	0	-------	0	2	2	3	0	1	0	9	37
Nevada:											
Reno	0	-------	0	1	1	0	0	0	0	1	2
Washington:											
Seattle	0	-------	-------	5	-------	8	0	-------	0	1	-------
Spokane	0	-------	-------	0	-------	0	0	-------	0	0	-------
Tacoma	0	-------	0	0	3	5	1	0	0	2	24
Oregon:											
Portland	0	-------	1	3	3	14	1	5	0	1	59
Salem	0	-------	0	25	0	0	0	0	0	0	-------
California:											
Los Angeles	24	17	3	702	8	67	32	21	2	34	288
Sacramento	0	2	1	2	2	0	0	1	1	49	25
San Francisco	3	13	2	1	4	10	0	9	0	74	135

City reports for week ended March 25, 1933—Continued

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Connecticut:			
Bridgeport	1	0	0
New York:			
New York	2	2	0
New Jersey:			
Newark	1	0	0
Pennsylvania:			
Philadelphia	1	0	0
Pittsburgh	2	1	0
Indiana:			
Indianapolis	9	0	0
Illinois:			
Chicago	23	8	0
Springfield	1	0	0
Michigan:			
Detroit	1	0	0
Minnesota:			
St. Paul	1	0	0
Iowa:			
Des Moines	1		0
Sioux City	1		0
Missouri:			
St. Joseph	0	1	1
District of Columbia:			
Washington	1	0	0
Virginia:			
Norfolk	1	0	0
Richmond	0	0	1
Tennessee:			
Memphis	1	0	0
Louisiana:			
New Orleans	1	1	0
Colorado:			
Denver	0	1	0
Washington:			
Seattle	1		0
California:			
Los Angeles	1	1	2
San Francisco	2	1	0

Lethargic encephalitis.—Cases: Buffalo, 1; New York, 2; Chicago, 1; Birmingham, 1.
Pellagra.—Cases: Washington, 1; Savannah, 2; Los Angeles, 1.
Rabies (in man): 1 case and 1 death at New Orleans.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—Two weeks ended March 11, 1933.—The Department of Pensions and National Health of Canada reports cases of certain communicable diseases for the two weeks ended March 11, 1933, as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba [1]	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis				2						2
Chicken pox		10	5	428	615	38	67	5	152	1,320
Diphtheria		1	2	47	30	3	15			98
Dysentery					1					1
Erysipelas				13	13	4	1	1	2	34
Influenza		56		14	97	1	5		13	186
Measles	5	24	13	390	658		18	6	25	1,139
Mumps		7			581	30	7		42	667
Paratyphoid fever					6					6
Pneumonia		6			20		26		11	63
Poliomyelitis				2						2
Scarlet fever		22	11	179	158	19	38	5	25	457
Smallpox					3		4			7
Trachoma					1				2	3
Tuberculosis	1	5	13	133	75	1	44	6	59	337
Typhoid fever			2	24	9	1			1	37
Undulant fever					13		1			14
Whooping cough				345	260	14	43	11	48	721

[1] Report from Manitoba for week ended Mar. 4 not included.

Ontario Province—Communicable diseases—Four weeks ended February 25, 1933.—The Department of Health of the Province of Ontario, Canada, reports certain communicable diseases for the four weeks ended February 25, 1933, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Cerebrospinal meningitis	4	2	Pneumonia		167
Chicken pox	1,258		Puerperal septicemia		1
Diphtheria	50	2	Scarlet fever	295	3
Erysipelas	4		Septic sore throat	33	2
German measles	8		Syphilis	81	
Gonorrhea	114		Trachoma	6	
Influenza	1,005	26	Trench mouth	3	
Lethargic encephalitis	2	2	Tularaemia	1	
Measles	1,489	5	Typhoid fever	19	1
Mumps	891		Undulant fever	5	
Paratyphoid fever	6		Whooping cough	437	1

CUBA

Habana—Communicable diseases—Four weeks ended March 25, 1933.—During the four weeks ended March 25, 1933, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	8	5	Tuberculosis	13	3
Malaria [1]	6	0	Typhoid fever [1]	14	3
Scarlet fever	1				

[1] Many of these cases are from parts of the island outside of Habana.

CZECHOSLOVAKIA

Communicable diseases—January, 1933.—During the month of January, 1933, certain communicable diseases were reported in Czechoslovakia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	1		Malaria	1	
Cerebrospinal meningitis	8	4	Paratyphoid fever	8	2
Chicken pox	328	1	Poliomyelitis	11	3
Diphtheria	3,298	187	Puerperal fever	42	14
Dysentery	5		Scarlet fever	1,985	23
Influenza	23,372	179	Trachoma	81	
Lethargic encephalitis	3	2	Typhoid fever	411	42

YUGOSLAVIA

Communicable diseases—February, 1933.—During the month of February, 1933, certain communicable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	49	8	Poliomyelitis	9	2
Cerebrospinal meningitis	14	5	Sepsis	11	3
Diphtheria	789	118	Scarlet fever	267	15
Dysentery	267	3	Tetanus	12	9
Erysipelas	147	4	Typhoid fever	269	56
Measles	918	13	Typhus fever	184	7
Paratyphoid fever	15	1			

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

(NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for March 31, 1933, pp. 334-345. A similar cumulative table will appear in the PUBLIC HEALTH REPORTS to be issued April 28, 1933, and thereafter, at least for the time being, in the issue published on the last Friday of each month.)

Cholera

Philippine Islands.—During the week ended April 1, 1933, 2 cases of cholera with 2 deaths were reported at Ormoc, Leyte Province, Philippine Islands.

Plague

Ecuador.—During the month of March, 1933, 3 cases of plague were reported near Guamote, Ecuador.

Yellow Fever

Senegal—Bakel.—On April 1, 1933, a case of yellow fever was reported at Bakel, Senegal.

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